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Abstract

This study estimates the effect of job loss for Finnish workers displaced during a severe recession in the early 1990s. The setting provides a sample of workers of which over 90% experienced unemployment after losing a job due to plant closure. We use linked employer-employee data to follow these workers up to 16 years after the job loss and to construct a closely matched comparison group of non-displaced workers. We estimate over 58% initial drop in employment and earnings after the job loss. At the end of follow-up, women's employment and earnings recover fully while men's employment remains 1–5% lower relative to the comparison groups and they suffer a 5–8% earnings loss. We also find large effects on long-term unemployment that diminish slowly and long-lasting effects on poverty risk.

Key words: Unemployment, plant closings

JEL classes: J65, J64

1 Introduction

This paper estimates the effect of job loss for Finnish workers displaced during a severe recession period in the early 1990's. The recession period provides a sample of workers of which over 90% experienced unemployment after displacement due to plant closure. The analysis of plant closures in our setting provides different type of variation than in previous displacement literature. In a typical plant closure during moderate economic conditions, a majority of the workers is re-employed shortly after the closure. Here we are able to study the long-term effects of unemployment after an economic crisis rather than the effect of displacement alone.

The Finnish recession began due to multiple macroeconomic shocks that led to a rapid increase of unemployment rate from 3 to 16 percent in three years. The main factors behind the recession were liberalisation of the credit markets, failed monetary policy and collapse of the bilateral trade with Soviet Union in 1991. The shocks caused by these events were difficult to anticipate for the firms and a large number of plants were forced to close down.

While the results from this severe recession cannot be directly generalized to periods of regular macroeconomic variation, they are still important from a policy perspective. The U.S. evidence from the 2007 financial crisis shows that costs of the job loss were unusually high in this period, although the increase in the unemployment rate was not particularly large by European standards (Farber 2015). This suggests that previous studies may severely underestimate the costs to current high-unemployment countries suffering from the aftermath of the financial crisis. On the other hand, results from a severe recession period provide a useful upper bound of the costs, especially given the scarcity of credible empirical evidence on the effects of unemployment

The main outcomes in this study are earnings and employment. Up to 16 years follow-up period allows us to study the persistence of unemployment after the initial job loss. In addition to the productivity measures, we also study exclusion from labour markets by constructing indicators for long-term unemployment and poverty.

Focusing on plant closures in a recession period is likely to provide a sample of displaced workers from plant closures that are more randomly selected than those displaced during regular macroeconomic conditions. The firms in this sample were forced to close down quickly which left less time for the firms to adjust their production by laying off their less productive workers. We analyse the dynamics of plant closure over the three years recession period which provides new insights on how the effect of job loss varies in the different phases of the recession.

Our data are based on the Finnish linked employer-emplyee data. The analysis sample includes private sector workers between 25 to 65 years of age with a stable employment in 1990. We observe these workers from 1988 to 2007 which provides us a 14 to 16 years follow-up period depending on the year of the job loss. Overall the analysis sample includes 289,000 workers of whom 9,200 are identified to experience a job loss due to plant closure. A rich set of individual and firm level background characteristics allows us to construct a very closely matched control group of non-displaced workers. While our analysis sample does not cover all the workers in the analysed firms, we observe complete firm and plant level worker flows over time needed for defining plant closures. In addition, an exceptional element in the data is the information about the reason of job loss provided by the employment services. This helps us to identify true plant closures very reliably while previous register based studies have relied solely on changes in plant identifiers.

We estimate the effect of job loss in the recession years 1991–93 using matching estim-

ators. First we estimate effects by the year of plant closure to study the dynamics of the recession. The job loss causes over 58% initial drop in employment and earnings of the displaced workers. The effect diminishes gradually over the follow-up period as the displaced catch-up the comparison group slowly. Although the descriptive analysis points to large differences in the employment and earnings patterns between workers displaced in the early and late phase of the recession, the matched sample shows virtually no differences in their earnings and employment dynamics. We then construct a pooled sample to study the effects of job loss on additional outcomes and utilise the large sample size to study the effect heterogeneity with respect to background characteristics. All results are estimated separately for men and women. Men's employment recovers somewhat sooner but their recovery stalls compared to women. At the end of follow-up, the effect of job loss disappears for women but men suffer a 5–9% earnings loss. We also find the effects to be substantially larger for older workers.

The article is organised as follows. The next section discusses the related literature studying the effect of job loss and unemployment. The section 3 provides an overview of the macroeconomic environment during the recession and follow-up period and discusses briefly the Finnish unemployment benefit system. The analysis data is described in the section 5 and the empirical strategy is presented in the section 6. The section 7 presents the results and the final section concludes.

2 Related studies

Early papers analysing displaced workers focused on permanently displaced workers or mass-layoffs where firms downsize e.g. by 30% or more (Ruhm 1991 and Jacobson et al. 1993). More recent papers study plant closures where all workers of establishments have been laid-off. Most of these studies on job loss analyse the effect on the average earnings in the years following the job loss. Couch & Placzek (2010) compare different estimators and results from different US datasets to study why the variation in the estimated earnings losses has been so large. They conclude that economic conditions at the time of displacement play a key role. Jacobson et al. study a recession period in Pennsylvania and find 25% earnings losses 6 years after displacement relative to non-displaced workers while other studies focusing on periods of moderate economic conditions find much smaller losses.

In addition to economic conditions, the institutional environment is an important feature in determining the effect of job loss. European countries have stronger employment protection and more generous unemployment insurance in general. For example, Hijzen et al. (2010) studying the UK data point out that in Europe earnings losses are mostly due to periods of non-employment whereas in the US the main reason is lower wages after re-employment. They have also access to firm level data which allows them to compare results from plant closures and mass-layoffs. They find 18–35% losses for workers who exit firms that close down and 14–25% losses for workers who exit due to mass-layoff.

Several studies have also analysed Nordic countries that provide long panel datasets with employee-employer links. Eliason & Storrie (2006) analyse all Swedish plant closures in 1987 and follow the displaced workers until 1999. While their results indicate more modest earnings losses compared to Hijzen et al., the losses seem to be permanent. The employment level remains around 3% lower due to displacement in 1999. Using Norwegian data, Huttunen et al. (2011) study mass-layoffs between 1991 and 1998. They find 3% earnings losses after

a 7 years follow-up. These results can be contrasted to results from Finland by Korkeamäki & Kyyrä (2014). They compare displacements due to plant closures and mass-layoffs from a deep recession period in 1992 and from a recovery period in 1997. Using quantile regression they show that men's median losses after 7 years are 15% for those displaced during the recession and around 0% for the recovery period. Their analysis also reveals that the effect is very asymmetric as the lower end of the earnings distribution suffers the largest losses.

A job loss can be mentally difficult affecting a wide range of outcomes. Several studies have shown that displacements decrease health and increase mortality (e.g. Sullivan & Von Wachter 2009 and Browning & Heinesen 2012). Martikainen et al. (2007) show the increase in mortality for Finland by analysing downsizings and plant closures in 1989 and 1994. Finally, Huttunen & Kellokumpu (2016) show that displacements decrease fertility by studying Finnish mass-layoffs and plant closures during the recession years 1991–1993. While they analyse also earnings in the same setting as this study, their analysis focuses on displaced couples which means the results do not generalise to all workers.

A large number of studies have attempted to identify the effect of unemployment on various outcomes. Some studies utilise different modelling techniques to estimate the state dependence in unemployment (Arulampalam 2001, 2002; Gregory & Jukes 2001). Focusing on youth unemployment, Gregg (2001) and Gregg & Tominey (2005) use past local unemployment rate as an instrument for employment status and Skans (2011) uses sibling fixed effects combined with detailed background characteristics to overcome the selection problem. All these studies suggest that unemployment has sizeable and persistent effect on future earnings.

This study contributes to the literature by studying workers displaced in a deep recession period of whom a large majority also face an unemployment spell after job loss.[1] We extend the previous study on Finnish recession by Korkeamäki & Kyyrä (2014) in several ways: we have twice as long follow-up period allowing to analyse long-term effects and we examine recession dynamics as well as effect heterogeneity with respect to background characteristics. We also provide a novel aspect on the analysis by emphasising the distributional aspects of the job loss using long-term unemployment and poverty indicators. Compared to previous studies on unemployment persistence, we utilise exogenous variation from plant closures to avoid the selection problem. A limitation of our setting is that the results do not necessarily generalise to periods of more moderate economic conditions. Nevertheless, they may provide an upper bound for the costs of displacement. In addition, the estimates for a severe recession period are important in their own right because they help countries suffering from high levels of unemployment in planning optimal labour market policies.

3 Finnish labour markets in the 1990's

3.1 The recession

In the late 1980's, the Finnish economy experienced a period of rapid growth, 3.4% on average.[2] As illustrated in Figure 1, the unemployment rate was low. Long-term unemployment was uncommon mainly because of active labour market policy. Before the recession started at the end of 1990, the economy was overheated. This was partly due to financial deregulation

[1] Verho (2008) is the first study to analyse job losses in the Finnish recession. This paper extends the analysis in many respects and utilises more comprehensive data with plant identifiers.

[2] A more detailed discussion on the recession can be found, for example, in Honkapohja & Koskela (1999).

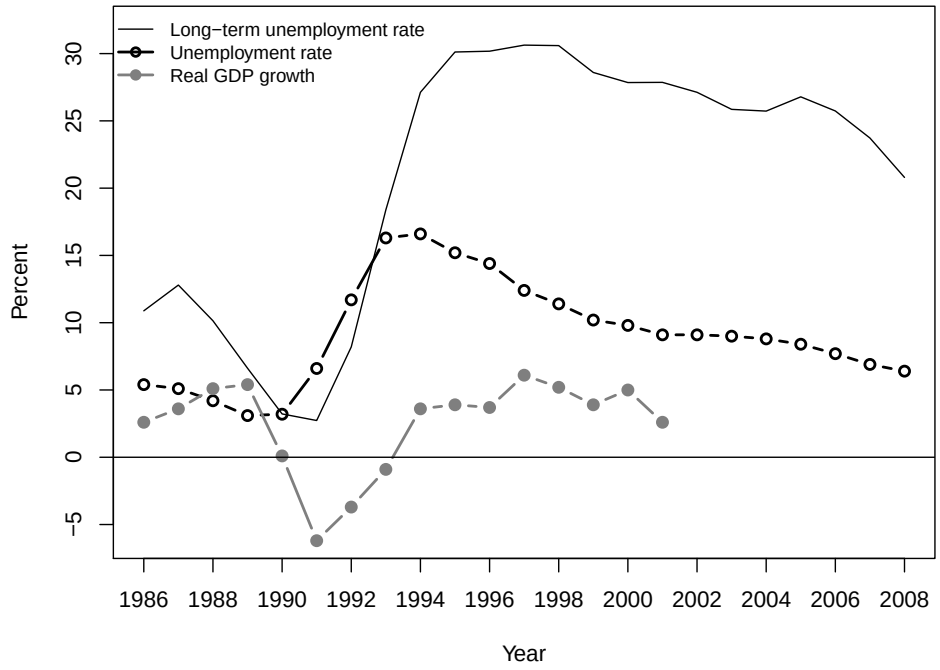

Figure 1: Unemployment rate, long-term unemployment rate ($\geq$ 12 months) and real GDP growth in Finland (Statistics Finland; Labour Force Survey).

which led to an increase in private borrowing and risk taking. The tax system favoured debt financing of investments. In addition, firms had incentives to acquire foreign debt due to the difference between foreign and domestic interest rates.

Finnish currency, the markka, had a fixed exchange rate in the 1980's. In March 1989, the markka was revaluated as a late response to foreign capital inflow. The fixed markka started to face growing speculative pressure from 1990 onwards and the defence of markka led to an increase in the real interest rates. At the same time, the German unification raised interest rates in Europe which raised the rates in Finland even further. This caused serious trouble for heavily indebted firms. Also domestic demand declined and the export sector suffered from a loss in price competitiveness.

The collapse of the Soviet Union in 1991 also contributed to the decline in the economy. The bilateral trade, which was 15% of total exports, dropped by 70%. In November markka was devaluated. As the recession started to become deeper, reductions in asset values and liquidity variables caused private consumption and investment to drop. This, combined with the drop in bilateral trade and high interest rates, forced many firms to be closed down. Especially firms with high foreign debt had problems.

The economic downturn came as a surprise for firms and policy makers. The foreign shocks were hard to anticipate but problems arising from increasing risk taking and indebtedness of private sector might have been possible to perceive. However, this does not seem to be the case. In autumn 1990, all Finnish economic research institutes failed to forecast the sharp downturn in the late 1990 and 6% drop in GDP for 1991.[3]

[3]The difficulties in forecasting the recession are discussed in Vartia (1994).

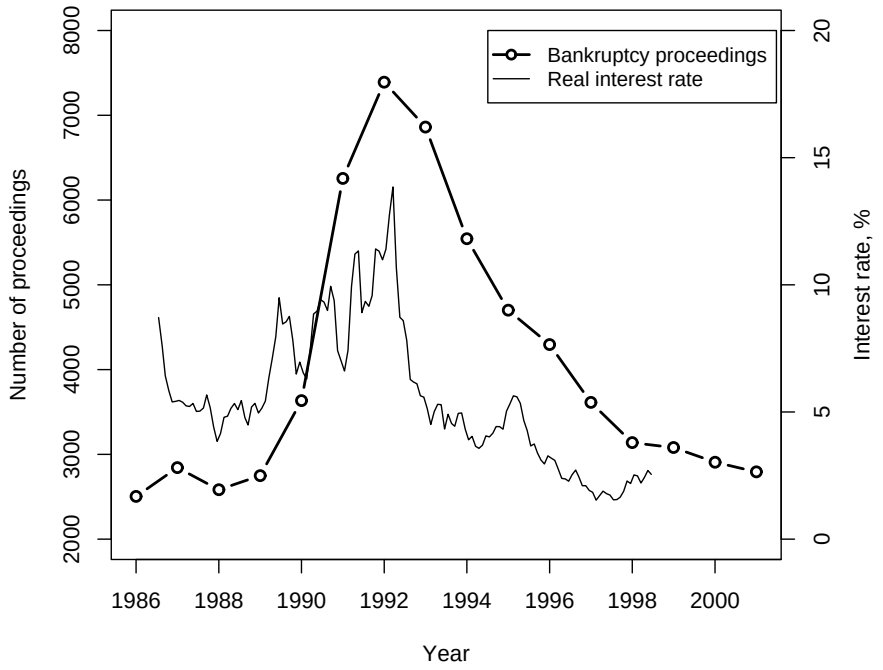

Figure 2: Number of started bankruptcy proceedings and the real 3-month interest rate in Finland (Statistical Year Book 2005; Bank of Finland).

The number of firm closures grew sharply when the recession started. Figure 2 shows the number of bankruptcy proceedings together with the short-term real interest rate in Finland. The number of proceedings more than doubled from the pre-recession level. One of the key factors causing problems for the indebted firms was the high real interest rate. The peak of 14% coincides with the year with the largest number of bankruptcy proceedings. As the firms had problems and laid off workers, the unemployment rate rose from 3.2% to 16.6% in three years.

3.2 Unemployment benefits

At the time of the recession, displaced workers were eligible for earnings related unemployment benefits for 500 working days if they had worked more than six months and were members of an unemployment fund. For the median income worker with earnings related benefits, the benefit level was 55% of pre-unemployment income (in 2003, gross income 1,178 euros per month). Otherwise they received the basic allowance which is substantially lower. For example, in 2003 the basic allowance without child supplements was 23 euros per working day.

Unemployed individuals must register to the public employment services to receive benefits. Thus displaced workers have a strong incentive to register. In addition, the provided information should be reliable because a document about the displacement is required to avoid a long waiting period. Before 1993, workers who have quit faced a six weeks waiting period while displaced workers had only a one-week waiting period.

Older unemployed people have an option for an early retirement scheme that affects con-

siderably their re-employment incentives (Kyyrä & Wilke 2007). Before 1997, individuals older than 53 years of age were entitled for earnings related benefits until retirement. The age limit was raised to 55 years in 1997. The impact of job loss is analysed separately for older workers in the heterogeneity analysis by studying those over 46 years of age at end of 1990. The youngest in this group became entitled to the early retirement scheme in 2000. The regular retirement age is 65 years and early retirement without unemployment benefits was possible at the age of 60.

4 Data

Analysis data consist of workers who were employed in Finnish private sector firms in 1990. The dataset is based on Statistics Finland's linked employer-employee data (FLEED) that include a wide range of individual and firm characteristics. Our analysis sample covers all workers with a stable employment history prior to the recession period. We complement these data with plant level data covering all firms to define plant closures.

The individual level dataset includes all Finnish workers between 25 and 65 years of age who were employed 12 months in 1990. The sample was restricted to private sector workers by including only those with a private sector pension scheme (TEL). This initial sample includes around 344,000 observations but after excluding workers with low annual income indicating part-time work and few hundred observations with missing covariates, the sample size reduces to 289,000 observations.

The analysis data cover the years from 1988 to 2007. This means that all workers can be followed 14 years after the recession. The analysed outcomes are annual earnings, taxable income, months in employment and months in unemployment. In addition, to analyse the persistence of unemployment and exclusion from labour market on individual level, we define an indicator for long-term unemployment. The indicator takes the value one if a full year of unemployment is followed by at least one month of unemployment in the next year. Finally, we define an individual level poverty indicator based on annual income. The poverty threshold is derived from the Statistics Finland's annual poverty risk threshold for single-person households.[4]

Most of the background characteristics are observed at the end of 1990. The individual characteristics include age, the level of education, native language, the number of children, an indicator for spouse, the region of residence and an indicator for house ownership. The variables describing firms are industry code (NACE rev. 1.1) and plant size. The changes in the employment status are observed at the end of each year. The previous earnings are observed for the years 1988–1990 which allows us to control for pre-recession trends in earnings.

5 Empirical strategy

Our objective in the empirical analysis is to estimate the causal effect of displacement by constructing a valid comparison group for the displaced workers. We begin by discussing

[4]The statistical at-risk-of-poverty threshold is defined as 60 per cent of the national median disposable income. The disposable income is calculated for consumption units on household level. The analysis data do not include disposable income. Therefore, the indicator is constructed using individual taxable income and it should be interpreted as a crude proxy for relative poverty.

the exogenous variation provided by plant closures in the context of the Finnish recession. Then we provide descriptive statistics for the analysis groups and present trends for the key outcome variables. Finally, we discuss different matching estimators that we use to construct comparison groups for the displaced workers and show the matching balance.

5.1 Plant closures

Many studies have analysed mass-layoffs because they provide exogenous variation in employment on individual level. In a regular downsizing, employers have an incentive to displace the least productive workers first. When the plant is closed down and all workers are displaced, this selection process does not take place (see e.g. Gibbons & Katz 1991). However, a selection process may also take place on industry level when the least productive establishments are closed down first. If these productivity differences are related to unobserved worker characteristics the empirical analysis suffers from a selection problem.

The Finnish 1990's recession includes several features that reduce possible selection problems significantly. First, Finnish firms were hit by several external shocks that meant plant closures were mainly a result of firms' financial position or their reliance on export markets and much less of the poor competence of firms' workers. Second, the definition of plant closures is likely to be imprecise and subject to measurement error. Employee-employer data consist typically of annual cross-sections that may mask important worker flows because plant closings are evolving and gradual processes. Errors arise if workers anticipate layoffs and find new jobs before the closure. This leads to so called early-leaver problem because the most able workers are more likely to exit first (Lengermann & Vilhuber 2002; Schwerdt 2011). In addition, data may not be informative at which point a plant or establishment is closed down. Using a too strict definition leads to false negatives when true plant closures are excluded from the treatment group. On the other hand, too loose criterion means that treatment group includes plants with a large downsizing which in the end did not lead to complete closure. Such plants may keep their most productive workers and use recalls to employ their displaced workers.

The abruptness of the Finnish recession is very beneficial for the analysis of plant closures. The economy turned from a boom to a deep recession within few months. The external shocks where very difficult to anticipate for workers and the huge rise in unemployment made anticipatory exits less likely. We believe these factors reduce early leaver problem considerably compared to periods of regular business cycle variation.

To obtain a reliable definition for plant closures, we restrict the analysis to firms with over 10 employees in 1990. The first condition for a closure is that a plant downsizes more than 90% of its workforce in a given year. The second condition requires that less than 10% of these workers move together to a new plant in the following year to ensure that the closure was not a result of restructuring firm's organisation or a sale of firm's unit. The third condition is that at least some of the plant's workers register as job seekers at the employment office and they identify plant closure as the reason for their job loss. The registering is required for the application of unemployment benefits and it can also be done during the notice period before the unemployment spell has begun. This condition reduces the number of plant closures substantially but it also eliminates the majority of false closures.

Using these conditions we identify a total of 486 plant closures in the recession period (178 in 1991, 182 in 1992 and 126 in 1993). After removing a small number of remaining potential false closures by excluding plant codes that reappear within two years, we are left with 9263

displaced workers who compose the treatment group of the analysis. These workers fulfil the sample inclusion criteria and were full-time employed in years before the job loss. A vast majority of them experienced at least short unemployment in the year of plant closure or the following year. The share of workers with no registered unemployment spell is 9.2%, 7.0% and 8.9% for those displaced 1991–1993, respectively.

We define the comparison group annually by using similar employment history criteria as for the plant closure group but in the year of the closure they continue with full employment and they are not working in a heavily downsizing firm (over 50%). However, it should be noted that we do not condition on future outcomes which means, for example, that a worker in the 1991 comparison group may experience displacement and unemployment from 1992 onwards. In addition, the later plant closure and comparison groups have on average more stable employment histories because they have survived the early recession employed. Using these criteria our annual comparison groups include a total of 142,750 workers.

5.2 Descriptive analysis

The key background characteristics of the analysis groups as well as for all unemployed individuals are presented in Table 1. All characteristics are observed in the pre-recession period at the end of 1990. Comparison of the non-displaced control group and plant closure group reveals that earnings are similar for men but 6% lower for women in the closure group. Women in the closure group are also slightly older. The level of education shows a larger difference as those in the closure groups have more commonly only a basic or vocational education which reflects the fact that they are more often blue-collar workers. They are also more often living with a spouse but have less often children.

Although the closure groups are fairly similar to the comparison groups in many respects, the differences reflect the fact that plant closures took place more commonly in the manufacturing industry. 72% of the men in the closure group work in manufacturing while in the comparison group the share is only 55%. For women, the difference is larger as the respective shares are 75% and 43%. This is also related to the fact that the closure groups include more blue-collar workers. Finally, the closure groups are employed more often in medium sized plants employing between 26–100 workers compared to the comparison groups.

The group of all unemployed workers includes those who experienced at least some unemployment during the recession years. They have surprisingly similar characteristics to both analysis groups. The main differences are in the industry distribution and plant size. Experiencing at least a short unemployment spell was very common in the recession period and the all unemployed group includes 64% of the workers in the analysis sample. The similarity between the groups indicates that unemployed in the recession period were a less selected group when compared to the periods of regular regular macroeconomic variation.

The upper panels of Figure 3 present the average annual employment and earnings in the analysis period for the plant closure groups. The averages for the analysis population are shown for comparison and to illustrate the massive impact the recession had among private sector workers. In 1990, all individuals have full employment because of the analysis sample restriction. But when the recession begins, the average months in employment nearly halves in the three years. In 1994, the economy starts to recover but employment in the analysis population remains on a low level. The lack of recovery is partly explained by cohort effects and retirement. The earnings follow very closely to the employment pattern.

Table 1: Descriptive statistics.

	Comparison		Closure		All unemployed	
	Men	Women	Men	Women	Men	Women
Earnings (EUR)	20.959	15.770	20.556	14.731	20.627	15.685
S.D.	6.490	4.327	6.212	3.939	6.609	4.522
Age	39.132	40.403	39.549	41.756	39.137	41.223
S.D.	9.591	9.434	8.745	8.427	9.473	9.550
Education						
Basic	0.328	0.437	0.365	0.497	0.341	0.457
High school	0.027	0.041	0.014	0.021	0.029	0.044
Vocational	0.395	0.328	0.447	0.377	0.405	0.327
Tertiary, lower	0.154	0.149	0.121	0.086	0.141	0.131
Tertiary, higher	0.096	0.045	0.053	0.019	0.085	0.042
Socio-economic status						
Blue-collar worker	0.609	0.420	0.704	0.635	0.609	0.409
White-collar, low	0.249	0.513	0.205	0.331	0.256	0.520
White-collar, high	0.141	0.067	0.091	0.033	0.135	0.072
Family type						
No spouse	0.306	0.372	0.254	0.311	0.312	0.372
Spouse	0.694	0.628	0.746	0.689	0.688	0.628
Number of children						
0	0.553	0.571	0.493	0.555	0.553	0.587
1	0.195	0.220	0.215	0.240	0.192	0.213
2	0.185	0.170	0.224	0.174	0.185	0.161
3 or more	0.067	0.039	0.067	0.031	0.070	0.038
Industry						
Primary production	0.018	0.009	0.001	0.000	0.015	0.007
Manufacturing	0.545	0.430	0.715	0.754	0.454	0.370
Construction & utilities	0.106	0.029	0.096	0.028	0.147	0.033
Sales & restaurants	0.159	0.296	0.119	0.160	0.202	0.351
Other	0.173	0.236	0.069	0.058	0.182	0.240
Plant size						
-25	0.227	0.251	0.249	0.164	0.448	0.454
26-50	0.176	0.177	0.238	0.240	0.150	0.138
51-100	0.170	0.178	0.252	0.302	0.124	0.131
100-	0.427	0.393	0.260	0.295	0.278	0.276
N	80200	62550	5340	3923	113362	72856

Note: All variables are observed in 1990. Industry classification refers to the following NACE main codes: A–C, D, E–F, G–H and I–X, respectively.

All plant closure groups face a similar decline in employment but those who were displaced in 1991 experience weaker recovery in the post-recession period. The same difference between 1991 and later groups is also seen in the earnings. It should be noted that the 1991 group has also lower initial earnings due to the fact that this group includes a higher share of women compared to later years. The employment levels in all closure groups recover until 1997 when the 1992 and 1993 groups reach the average level in the analysis population. The recovery is similar for earnings although the gap between the 1991 group and the two other groups is more pronounced.

The lower panels of Figure 3 present employment and earnings for the comparison groups. All these groups are expected to show a decline in the average employment because all fully employed individuals change their labour market status eventually. However, they all suffer considerable drops in employment in the first follow-up year. The drop is large for the 1991 group because they are followed during the recession years and relatively small for the 1993 group because the recession starts to turn into recovery in 1994. Interestingly, the 1993 group faces only a small decline in earnings compared to their steady decline in employment. The 1991 and 1992 groups follow closely the employment and earnings trend of the analysis population.

5.3 Matching and covariate balance

The objective in this analysis is to estimate the causal effect of job loss on outcomes measuring the labour market performance, earnings and income of the workers displaced during the Finnish recession. We utilise a matching estimator that combines propensity score matching with exact matching on earnings. We begin by discussing the matching model that we use to estimate the average treatment effect on the treated separately for each annual plant closure group. Then we describe how the analysis sample is pooled to estimate the effect jointly for all closure groups. To account for gender differences in labour market outcomes, all models are estimated separately for men and women.

The propensity scores are estimated by a logit model with covariates observed at the end of 1990. The covariates include individual background characteristics, firm characteristics and earnings history for 1988 and 1989. The detailed variable definitions and the matching balance for the pooled samples are provided in Appendix. The output for annual models is not included for brevity.

The exact matching is done using 20-quantiles of the 1990 earnings in the plant closure groups. We also use a ceiling of 47,000 euros which excludes the top 1% earners in 1990 from the sample. The 20th and 80th percentiles are 13,390 and 22,520 euros, respectively, which means that earnings are matched roughly in 600 euros bins for the majority of the workers.

With respect to the propensity score, workers are matched by the nearest neighbour method using the linear predictors from the logistic regressions. To increase the efficiency of the estimator, several controls are used if they all match a treated individual. A tolerance value 10^{-5} is used to determine the acceptable distance. The standard errors are estimated following Abadie & Imbens (2006).

A pooled sample is constructed to analyse the annual closure groups jointly. The main problem in pooling the data is that the annual comparison groups are largely overlapping because all the workers in the 1993 comparison group belong also in the 1991 comparison group. To create a sample that allows exact matching on year-specific comparison groups, all

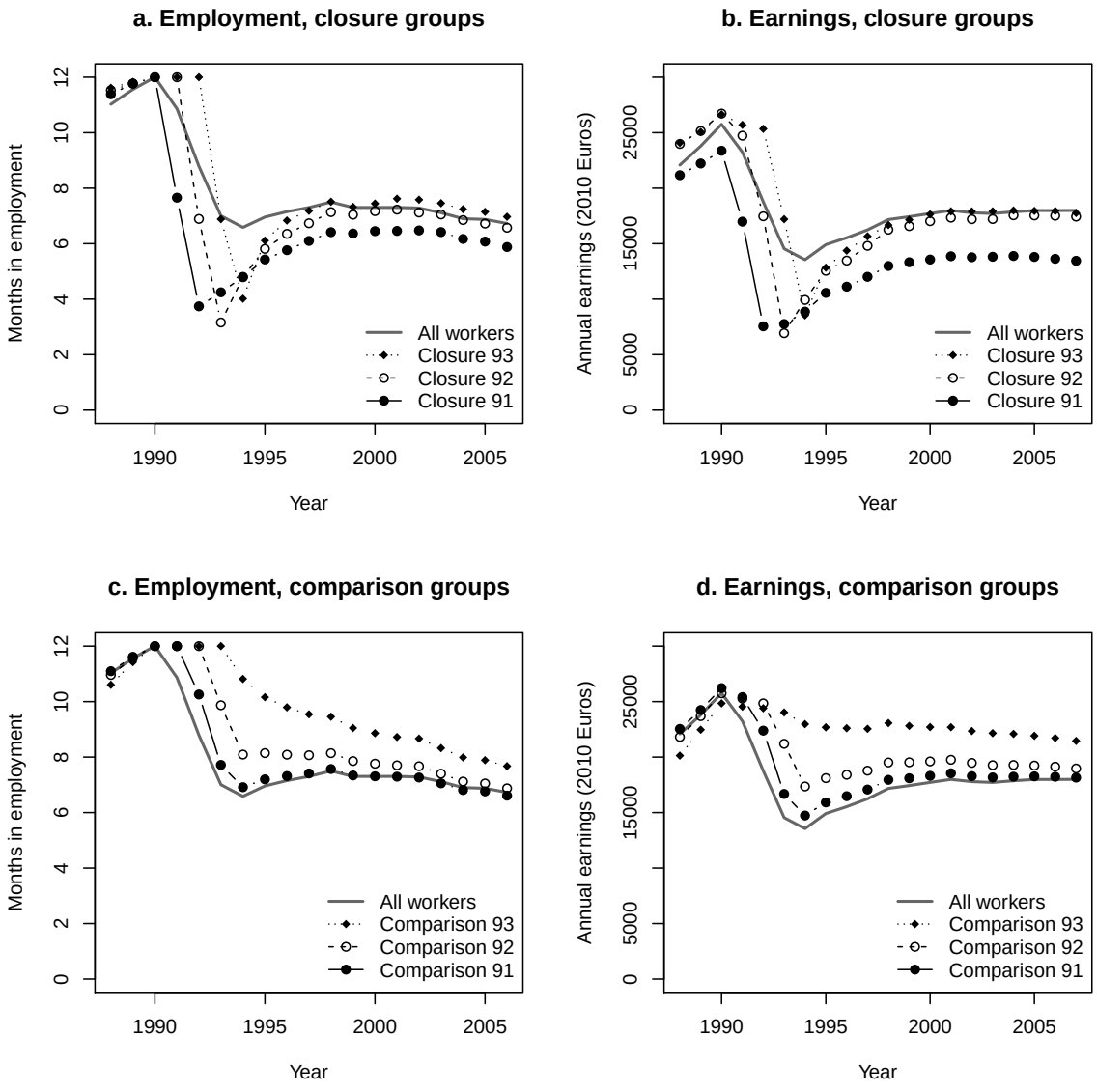

Figure 3: Average months in employment and annual earnings for displaced workers and comparison groups by the year of plant closure.

controls are randomly split into three sets. These distinct sets provide still enough observations so that year-specific comparison groups can be matched using a similar procedure as for the separate annual models. The only difference is that an exact matching variable is added to ensure the correct comparison of year-specific treatment and comparison groups.

The descriptive analysis suggests that the comparison groups have relatively similar compositions to the closure groups although most background characteristics are statistically different before matching. Because the comparison groups are much larger than the plant closure groups limited common support is not a problem in this setting. The matching balance for the pooled sample shows that 7.9% of women's and 4.0% of men's variables remain statistically different after matching on 5% level. For women, the differences remain for language, plant size and some regions of residence. For men, four industry categories of previous employers are imbalanced. The remaining differences are small, less than 3 percentage points, except for the manufacturing of leather clothes where 4.3 percentage points difference remains for men. Overall, we consider the analysis groups to be well balanced considering the detailed classifications used in the analysis.

6 Results

We present estimation results based on three different types of matching models.We begin with annual models where those displaced due to plant closure in the years 1991–1993 are matched separately to the respective comparison groups. These estimates allow us to study the dynamics of the recession and compare the effects of plant closure between years. Then we use a pooled sample to extend the analysis to additional outcomes and effect heterogeneity. The pooled sample provides more concise presentation of results although it is less informative about the recession dynamics. Also the larger sample size allows a more reliable analysis of effect heterogeneity by individual background characteristics.

Figure 4 presents the estimated effect of job loss by the year of plant closure and gender. The upper panel shows how the months in employment drop after the job loss. The change relative to the baseline, estimated using the matched comparison groups, is 65–71% for women and 58–66% for men. After the initial drop, the relative employment improves for the following ten years. Women's employment reaches the comparison group steadily while men's employment first recovers more quickly but then remains permanently 1–5% below the comparison group. The relative effects are remarkably similar between the annual plant closure groups.

The lower panel of Figure 4 provides the results for earnings. Overall, the effects on earnings are close to the employment effects which suggests that job loss affects mostly through employment and wage effects are less important. However, earnings recover slower than employment and, after 8 years, the earnings losses are in most cases at least 5 percentage points larger. A detailed wage analysis is not possible because earnings data are available only on annual level which does not allow to separate wage effects from changes in days in employment or working hours. At the end of the follow-up, men's earnings effects remain larger than for women as their long-term losses are 5–8%.

Compared to earnings losses found in previous studies, our initial effects are very large. The large effects can be expected because we focus on a severe recession period. However, the employment recovers rapidly and after 6 years the earnings losses vary between 15% and

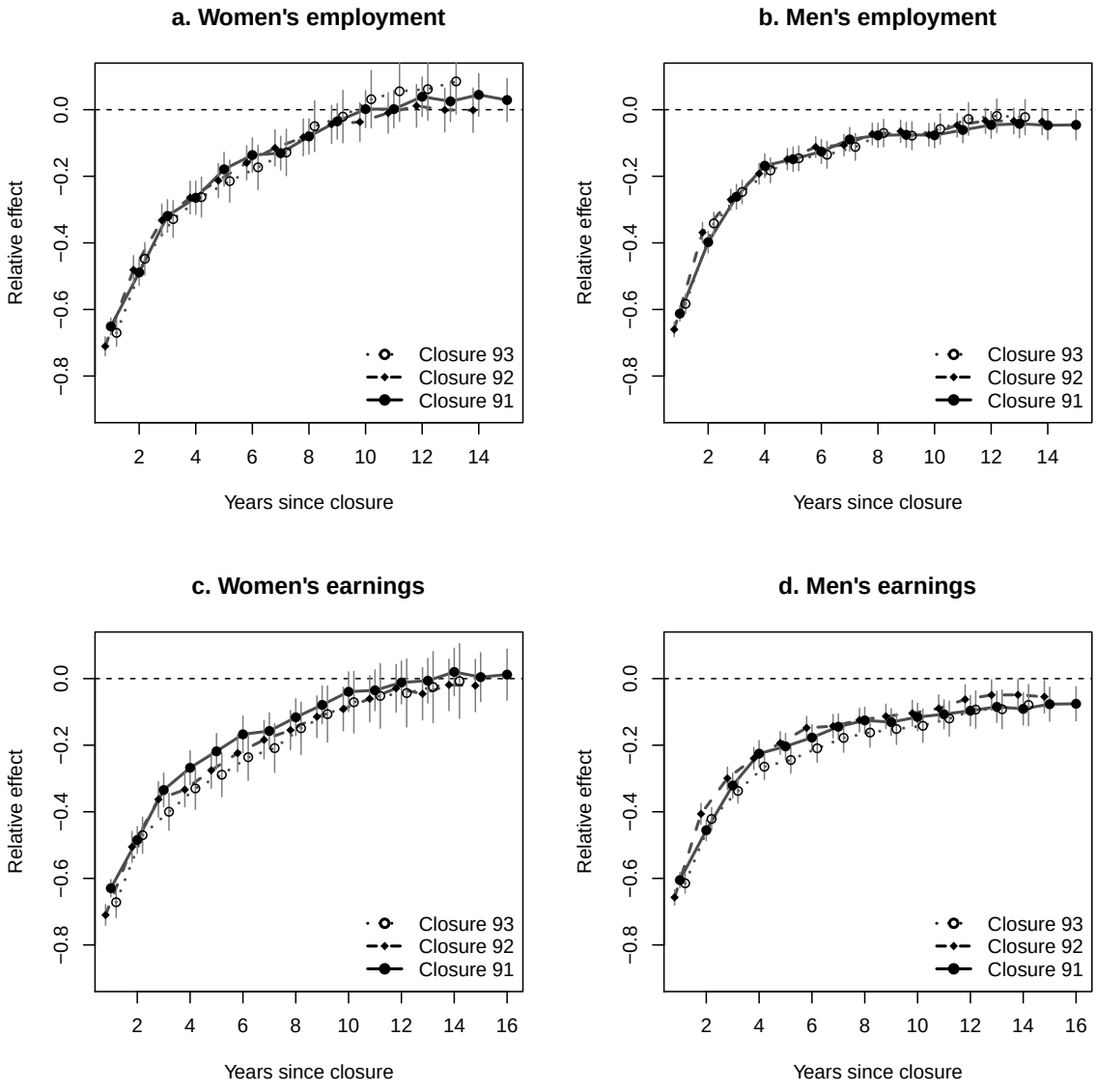

Figure 4: Relative effect of plant closure on employment and earnings by gender from annual models (vertical bars denote 95% confidence intervals).

23%. These are actually slightly smaller estimates than in Jacobson et al. (1993) who study a recession period in Pennsylvania. Other studies analysing periods of more moderate economic conditions typically also find more moderate effects. Hijzen et al. (2010) provide an exception as their estimates are in the range of 18–35% after 5 years for the UK.

Considering long-term effects of the job loss, only few studies have over 10 years follow-up. Eliason & Storrie (2006) is a notable exception. They follow displaced Swedish workers for 12 years and find a long-lasting effect on earnings and employment. While their initial effects are much smaller than here, their 3% decrease in long-term employment is in line with our results for men.

Some previous Finnish studies have also estimated the effect of job displacement for the Finnish recession years. Korkeamäki & Kyyrä (2014) estimate quantile earnings effects for those displaced in 1992. Their estimate for the median is similar in magnitude for the initial effect and the following 7 years. Their follow-up ends in 1999. Huttunen & Kellokumpu (2016) analyse couples in prime working age who were displaced in the recession years 1991–1993. Their estimates for initial earnings losses are only 22–23% and the losses seem to diminish slower compared to our estimates. The difference to our results is likely explained by their sample restrictions.

Pooled estimation

The pooled sample allows us to estimate the effect of job loss in calendar time using all analysis groups simultaneously. This means that the estimates are average effects over annual plant closure groups weighted by their group sizes. For example, the first follow-up year common to all groups is 1994 which is the first follow-up year for the 1993 closure group but the third for the 1991 group. Averaging over different years hides detailed dynamics of the job loss effect but it provides larger analysis groups that are needed for heterogeneity analysis. Presenting results in calendar time is also useful for understanding the macroeconomic impact of the recession.

The upper panel of Figure 5 shows the relative effect of job loss on employment and unemployment by gender. The pooled data estimation basically replicates the employment effects shown earlier for yearly closure groups. The trends are very similar for both genders and the confidence intervals are overlapping from 1998 onwards. However, the effect on months in unemployed shows a different pattern. In the beginning, the relative effect is very large, over 100%, for both genders. This is expected because of very large drop in employment. Then the unemployment effect starts to decline and the trends diverge as men's effect jumps in 1999. Women's effect continues to decline until it reaches 6% level in 2004. Men's effect decreases to 8% in 2006.

The middle panel in Figure 5 presents the effects on earnings and income. Again the pooled results are in line with the results for annual closure groups. The results for earnings follow very closely the pattern of employment effects. Income effects are more modest because taxable income includes social benefits. The most relevant benefit in this context is the earnings-related unemployment benefit. In addition, the gender difference disappears almost completely. The initial effect is around 23% income loss while the long-term loss is 4% for women and 6% for men which are in line with the long-term earnings effects.

The lower panel in Figure 5 shows the effect on additional outcomes that are derived from months in unemployment and income. The long-term unemployment indicates that

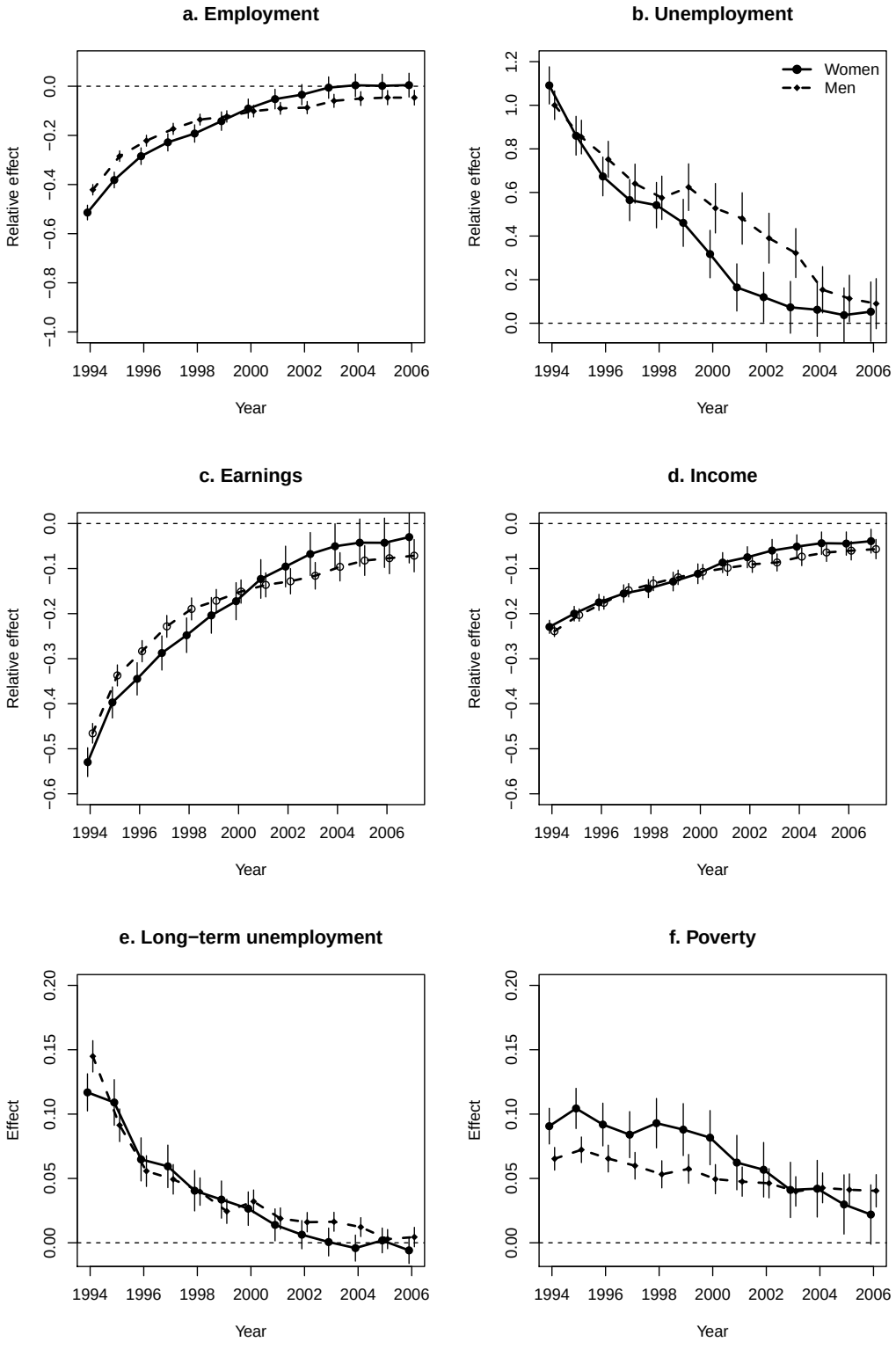

Figure 5: Effect of plant closure by gender using pooled data (vertical bars denote 95% confidence intervals).

unemployment has lasted over a full year. Contrary to other outcomes, these effects are presented in levels as the relative changes are very large due to low incidence in the control group. In 1994, the effect is 12 percentage points increase for women and 14 points increase for men. Then the effect declines steadily for both genders and women's point estimate reaches zero in 2002 and men's in 2005.

The poverty results show the increase in the share of those with personal income below the annual poverty threshold. For women, the increase remains over 9 percentage points until 1999 when the effect starts to decline. In 2006, the effect has declined to 2 percentage points. For men, the effect is much more stable. It starts from 7 percentage points and declines only slowly. In 2003, the effect is 4 percentage points and does not decline any further.

The increase in long-term unemployment relative to the comparison group is over 100% initially but drops below 50% by 1999. For women's poverty risk, the relative effects are similar to long-term unemployment while for men the risk remains elevated. In 1999, men's poverty risk is 85% higher and it declines to 37% by 2006. The high risk is probably linked to the lower level of employment and higher reliance on basic unemployment benefits.

Effect heterogeneity

Previous studies have shown that the effect of job loss is likely to be very heterogeneous. We study the effect heterogeneity with respect to age, education level, previous earnings, socio-economic status and industry. All these background characteristics are observed before the job loss in 1990. We conduct the analysis by splitting the pooled sample into sub-samples separately by each background variable.

We focus on employment and earnings outcomes in 2000 for simplicity. The main pooled sample estimates, presented in Table 2, imply 9.1% less months in employment and a 17.2% decrease in earnings for women. Men's main estimates show 10.1% lower employment and a 15.1% earnings loss. For both genders, the negative effects increase with age and they are very large for the oldest age groups. In case of education, the results are more diverse. Women with less education have the smallest employment effects, while for men, the employment and earnings losses are smaller for more educated.

The large losses for older workers are in line with Chan & Stevens' (1999) observation that a late-career job loss has a large and lasting effect on employment. Moreover, the Finnish early-retirement scheme for those over 53 years is likely to amplify this effect (Kyyrä & Wilke 2007). Hijzen et al. (2010) and Huttunen et al. (2011) studying displaced workers in the U.K. and Norway also find qualitatively similar but more modest age effects.

The relative effect of job loss decreases with previous earnings for men. Men with lowest earnings in 1990 suffer also the largest losses in euros whereas, for women, the earnings effect is the largest for those with 1990 earnings 19,001–23,000 euros. Interestingly, women's employment effects do not follow the same pattern. However, it should be noted that these estimates are not very precise.

The effect heterogeneity by previous earnings is reflected in the results for socio-economic status.The blue-collar workers face substantially larger losses compared to the white-collar workers, especially in case of men. A similar pattern is also present when analysing heterogeneity by the industry of previous employer. The largest losses for men are in manufacturing. For women the differences are less pronounced and losses are large also in retail sales and other similar services which are also typical blue-collar workplaces.

Table 2: Effect heterogeneity for earnings and months in employment in 2000.

	Employment Women			Employment Men			Earnings Women			Earnings Men		
	Relative effect	Estimate	S.E.	Relative effect	Estimate	S.E.	Relative effect	Estimate	S.E.	Relative effect	Estimate	S.E.
Main result	-0.091	-0.628***	0.137	-0.101	-0.839***	0.100	-0.172	-2087***	255	-0.151	-2868***	251
Age, years												
25–35	-0.039	-0.362	0.226	-0.045	-0.462***	0.126	-0.105	-1710***	460	-0.099	-2387***	369
36–45	-0.057	-0.492**	0.206	-0.086	-0.813***	0.152	-0.135	-2029***	380	-0.142	-3101***	398
46–60	-0.248	-0.707***	0.200	-0.309	-0.999***	0.201	-0.346	-1662***	342	-0.373	-2594***	437
Education level												
Basic	-0.061	-0.339*	0.203	-0.139	-0.943***	0.190	-0.155	-1431***	344	-0.196	-2853***	427
Secondary	-0.093	-0.720***	0.225	-0.106	-0.973***	0.144	-0.176	-2315***	413	-0.166	-3331***	346
Tertiary	-0.100	-0.952***	0.350	-0.033	-0.295	0.227	-0.149	-3043***	866	-0.083	-2132***	765
Earnings in 1990, euros												
–16 000	-0.099	-0.666***	0.166	-0.179	-1.419***	0.223	-0.166	-1777***	274	-0.236	-3484***	437
16 001–19 000	-0.095	-0.669**	0.325	-0.101	-0.827***	0.205	-0.182	-2467***	656	-0.139	-2374***	463
19 001–23 000	-0.048	-0.379	0.500	-0.105	-0.891***	0.194	-0.246	-4472***	1184	-0.160	-3152***	492
23 001–48 000	-0.010	-0.085	0.572	-0.037	-0.314*	0.189	-0.123	-2752	1868	-0.109	-2631***	606
Socio-economic status												
Blue-collar	-0.102	-0.658***	0.187	-0.122	-1.007***	0.125	-0.188	-1986***	309	-0.184	-3246***	279
White-collar	-0.058	-0.433**	0.213	-0.040	-0.335*	0.188	-0.151	-2244***	464	-0.085	-1866***	572
Industry												
Other	-0.058	-0.491	0.403	-0.029	-0.249	0.245	-0.132	-2230**	924	-0.079	-1752***	657
Manufacturing	-0.075	-0.500***	0.173	-0.121	-0.985***	0.131	-0.166	-1904***	309	-0.187	-3462***	322
Sales & restaurants	-0.119	-0.818**	0.318	-0.055	-0.458	0.301	-0.165	-1939***	613	-0.122	-2313***	799

Note: The results are estimated separately for each sub-sample defined by characteristics observed in 1990. Manufacturing refers to NACE code D and sales & restaurants refer to codes G–H. *denotes p-values < 0.1,**denotes p-values < 0.05, *** denotes p-values < 0.01.

7 Conclusions

The Finnish economic crises in the early 1990's provides an exceptional and interesting setting for estimating the effects of job loss and analysing unemployment persistence. We utilise exogenous variation in the employment status of workers who were displaced due to plant closure in the deep recession period from 1991 to 1993. This setting provides a large sample of displaced workers and allows us to study unemployment persistence because over 90% of the displaced workers experienced unemployment after displacement.

Our analysis shows that a job loss during the recession had a very large and long-lasting impact. The initial losses were substantial: months in employment drop by 65–71% for women and by 58–66% for men, depending on the year of plant closure. The earnings effects are of similar magnitude. These effects are much larger than estimated in studies on other European countries. However, these studies have not focused on severe recession periods and evidence from the U.S. suggest large losses can be expected for those displaced during a recession (Couch et al. 2011; Davis & von Wachter 2011). Also, our results are in line with previous Finnish studies analysing the recession period (Kyyrä & Wilke 2007; Huttunen & Kellokumpu 2016).

In the long-run, employment and earnings of the displaced mostly catch up with the matched comparison group. Women's effect of job loss disappears around 10 years after displacement while men have 1–5% lower employment and 5–8% lower earnings in 2006. These long-term effects are similar to results estimated by Eliason & Storrie (2006) for Sweden who, on the other hand, estimate relatively modest short-term losses. The analysis of effect heterogeneity shows that losses are heavily concentrated on older workers. In 2000, their employment is 25% lower for women and 31% lower for men compared to 9–10% decrease for all displaced. These results are likely to be partly explained by a early retirement scheme that affects re-employment of older workers in Finland (Kyyrä & Wilke 2007). The program has been cut back since then but before 1997 unemployed over 53 were entitled for earnings-related benefits until retirement.

The effect on unemployment reflects closely changes in employment. Also our long-term unemployment indicator points to a large initial effect that effect phases out over time. Therefore, we do not find evidence on permanent rise in individual unemployment persistence. On the other hand, our poverty risk indicator suggests around 4 percentage points long-lasting increase, especially for men.

Although the annually measured effects of job loss seem to mostly disappear over time, the very large short-term effects imply that those displaced in the recession period have shorter work histories and lower life-time earnings. These cumulative effects are also substantial from the fiscal point of view.

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Appendix

Table 3: Variable definitions.

Variable	Definition
Earnings	Annual earnings 1988–2007 in euros (ref: the first decile for 1988–89).
Income	Annual taxable income 1988–2007 in euros.
Employment	Months in employment 1988–2006.
Unemployment	Months in registered unemployment 1988–2006.
Age	Age in years (ref: 25–30).
Education	The level of education (ref: basic education).
Socio-economic status	Blue-collar is manual workers and others (ref.), white-collar low is lower-level employees, white-collar high is upper-level employees.
Language	Native language: other (ref.), Finnish, Swedish.
Family type	Married or cohabiting couple (ref: no spouse).
Number of children	Number of children aged under 18 (ref: no children).
Housing type	Type of dwelling: rental (ref.), house owner, other.
Region	Region of residence (NUTS 3, ref: '01').
Industry	Employer's industry classification (NACE rev. 1.1, ref: '01').
Plant size	Number of workers in establishment (ref: 10–24).

Note: All background characteristics are observed in 1990. The reference category is indicated in parenthesis.

Table 4: Matching balance for women 1/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Age 31–35	0.140	0.152	-3.569	0.034	0.140	0.143	-0.848	0.706
36–40	0.194	0.177	4.399	0.008	0.194	0.188	1.719	0.445
41–45	0.216	0.184	7.692	0.000	0.216	0.213	0.586	0.797
46–55	0.292	0.233	12.829	0.000	0.292	0.292	-0.138	0.951
56–65	0.050	0.052	-0.712	0.671	0.050	0.048	0.983	0.660
Education, High school	0.021	0.040	-13.588	0.000	0.021	0.022	-0.660	0.772
Vocational	0.377	0.335	8.624	0.000	0.377	0.366	2.153	0.334
Tertiary, lower	0.086	0.154	-24.008	0.000	0.086	0.093	-2.213	0.321
Tertiary, higher	0.019	0.047	-20.518	0.000	0.019	0.020	-1.229	0.562
Earn. 1988, 7021–9870	0.153	0.154	-0.156	0.926	0.153	0.166	-3.664	0.080
9871–11000	0.216	0.156	14.635	0.000	0.216	0.209	1.837	0.373
11001–12100	0.165	0.143	5.960	0.000	0.165	0.156	2.588	0.224
12101–13300	0.127	0.120	2.125	0.203	0.127	0.122	1.456	0.481
13301–14500	0.095	0.098	-0.816	0.626	0.095	0.094	0.564	0.786
14501–16000	0.068	0.076	-3.374	0.045	0.068	0.071	-1.489	0.470
16001–18000	0.045	0.056	-4.984	0.003	0.045	0.042	1.369	0.513
18001–21700	0.027	0.042	-8.847	0.000	0.027	0.028	-0.672	0.737
21701–	0.017	0.023	-4.324	0.011	0.017	0.018	-0.925	0.595
Earn. 1989, 9751–11400	0.232	0.160	16.996	0.000	0.232	0.235	-0.910	0.624
11401–12600	0.192	0.163	7.497	0.000	0.192	0.186	1.542	0.438
12601–13800	0.151	0.142	2.771	0.097	0.151	0.142	2.611	0.193
13801–15000	0.114	0.119	-1.716	0.306	0.114	0.108	1.730	0.387
15001–16300	0.073	0.094	-8.202	0.000	0.073	0.074	-0.601	0.771
16301–18000	0.055	0.073	-7.589	0.000	0.055	0.061	-2.566	0.207
18001–20200	0.034	0.055	-11.717	0.000	0.034	0.034	-0.407	0.839
20201–24400	0.031	0.040	-5.394	0.002	0.031	0.034	-2.025	0.305
24401–200000	0.016	0.022	-5.081	0.003	0.016	0.015	0.655	0.688
White-collar, low	0.331	0.518	-39.636	0.000	0.331	0.335	-0.805	0.695
White-collar, high	0.033	0.066	-18.276	0.000	0.033	0.035	-0.995	0.622
Finnish speaker	0.972	0.957	8.807	0.000	0.972	0.961	6.461	0.009
Swedish speaker	0.026	0.039	-8.135	0.000	0.026	0.037	-7.320	0.003
Has spouse	0.689	0.626	13.678	0.000	0.689	0.696	-1.421	0.520
N children, 1	0.240	0.222	4.127	0.013	0.240	0.233	1.673	0.448
2	0.174	0.177	-0.692	0.679	0.174	0.172	0.515	0.821
3-	0.031	0.040	-5.412	0.001	0.031	0.031	-0.002	0.999
House owner	0.334	0.388	-11.449	0.000	0.334	0.341	-1.471	0.512
Other housing type	0.229	0.257	-6.723	0.000	0.229	0.233	-0.826	0.714

Table 5: Matching balance for women 2/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Region, 02	0.086	0.094	-2.705	0.107	0.086	0.086	-0.160	0.943
04	0.051	0.058	-3.340	0.047	0.051	0.052	-0.366	0.871
05	0.059	0.037	9.457	0.000	0.059	0.054	2.070	0.343
06	0.070	0.103	-12.918	0.000	0.070	0.078	-2.920	0.202
07	0.105	0.062	14.266	0.000	0.105	0.103	0.847	0.696
08	0.084	0.041	15.384	0.000	0.084	0.069	5.604	0.009
09	0.033	0.027	2.955	0.075	0.033	0.032	0.285	0.899
10	0.024	0.022	1.292	0.438	0.024	0.025	-0.401	0.860
11	0.058	0.047	4.583	0.006	0.058	0.061	-1.520	0.488
12	0.012	0.026	-13.305	0.000	0.012	0.012	0.181	0.935
13	0.020	0.023	-2.291	0.174	0.020	0.016	2.718	0.205
14	0.073	0.032	15.738	0.000	0.073	0.074	-0.361	0.870
15	0.036	0.027	4.921	0.003	0.036	0.057	-11.047	0.000
16	0.026	0.009	10.639	0.000	0.026	0.027	-0.786	0.725
17	0.048	0.056	-3.699	0.028	0.048	0.036	5.372	0.013
18	0.003	0.016	-24.198	0.000	0.003	0.002	1.600	0.419
19	0.009	0.029	-21.683	0.000	0.009	0.008	0.707	0.745
20	0.009	0.018	-8.691	0.000	0.009	0.010	-0.790	0.731
21	0.000	0.003	NA	0.000	0.000	0.000	0.000	1.000
Plant size, 26–50	0.240	0.176	15.026	0.000	0.240	0.242	-0.577	0.796
51–100	0.302	0.174	27.725	0.000	0.302	0.323	-4.711	0.028
100-	0.295	0.409	-24.871	0.000	0.295	0.267	6.249	0.004

Table 6: Matching balance for women 3/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Industry, 02	0.000	0.003	NA	0.000	0.000	0.000	0.000	1.000
15	0.086	0.081	1.798	0.281	0.086	0.088	-0.580	0.791
17	0.047	0.024	10.939	0.000	0.047	0.055	-3.876	0.093
18	0.322	0.037	60.871	0.000	0.322	0.297	5.218	0.000
19	0.028	0.010	11.160	0.000	0.028	0.030	-1.059	0.636
20	0.063	0.021	17.165	0.000	0.063	0.072	-3.614	0.112
21	0.018	0.022	-2.562	0.129	0.018	0.018	-0.319	0.887
22	0.036	0.038	-0.937	0.576	0.036	0.040	-1.974	0.379
24	0.011	0.020	-8.798	0.000	0.011	0.014	-2.511	0.294
25	0.004	0.016	-18.428	0.000	0.004	0.004	0.493	0.823
26	0.017	0.015	1.144	0.492	0.017	0.017	-0.063	0.978
27	0.002	0.007	-10.106	0.000	0.002	0.002	0.465	0.833
28	0.017	0.021	-2.713	0.108	0.017	0.018	-0.846	0.709
29	0.014	0.032	-15.606	0.000	0.014	0.013	0.512	0.815
30	0.000	0.001	NA	0.000	0.000	0.000	0.000	1.000
31	0.016	0.024	-6.687	0.000	0.016	0.015	0.344	0.877
32	0.004	0.013	-13.030	0.000	0.004	0.003	1.734	0.408
33	0.001	0.006	-13.694	0.000	0.001	0.002	-0.968	0.685
34	0.009	0.010	-1.531	0.363	0.009	0.009	0.078	0.972
35	0.010	0.008	2.077	0.210	0.010	0.011	-1.440	0.539
36	0.048	0.023	11.772	0.000	0.048	0.049	-0.458	0.836
40	0.000	0.006	-22.281	0.000	0.000	0.000	1.123	0.566
45	0.027	0.019	4.698	0.004	0.027	0.028	-0.780	0.731
50	0.009	0.012	-2.836	0.094	0.009	0.010	-0.204	0.928
51	0.035	0.065	-16.186	0.000	0.035	0.034	0.647	0.763
52	0.090	0.140	-17.680	0.000	0.090	0.089	0.389	0.849
55	0.026	0.078	-32.486	0.000	0.026	0.022	2.341	0.258
60	0.004	0.008	-4.975	0.004	0.004	0.005	-1.497	0.527
61	0.000	0.002	-13.652	0.000	0.000	0.000	1.277	0.465
63	0.013	0.015	-1.334	0.427	0.013	0.015	-1.256	0.586
65	0.003	0.055	-89.669	0.000	0.003	0.004	-0.488	0.815
70	0.001	0.010	-28.794	0.000	0.001	0.001	-1.046	0.570
71	0.000	0.000	NA	0.000	0.000	0.000	0.000	1.000
72	0.000	0.008	NA	0.000	0.000	0.000	0.000	1.000
74	0.025	0.056	-19.743	0.000	0.025	0.023	1.088	0.614
75	0.000	0.002	-7.645	0.000	0.000	0.001	-0.814	0.740
80	0.000	0.005	-19.750	0.000	0.000	0.001	-1.198	0.637
85	0.007	0.030	-28.814	0.000	0.007	0.005	1.840	0.377
91	0.001	0.009	-21.562	0.000	0.001	0.002	-0.958	0.690
92	0.001	0.009	-29.673	0.000	0.001	0.001	-1.644	0.504
93	0.002	0.007	-14.266	0.000	0.002	0.001	0.273	0.898
99	0.000	0.000	NA	0.014	0.000	0.000	0.000	1.000

Note: Std. diff. is the standardized difference between treated and control units.

Table 7: Matching balance for men 1/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Age 31–35	0.168	0.166	0.438	0.761	0.168	0.171	-0.887	0.649
36–40	0.184	0.160	5.974	0.000	0.184	0.183	0.040	0.984
41–45	0.207	0.158	12.080	0.000	0.207	0.217	-2.552	0.190
46–55	0.214	0.197	4.264	0.003	0.214	0.204	2.533	0.186
56–65	0.038	0.051	-6.985	0.000	0.038	0.031	3.601	0.050
Education, High school	0.014	0.028	-11.895	0.000	0.014	0.013	0.373	0.844
Vocational	0.447	0.403	8.984	0.000	0.447	0.456	-1.636	0.391
Tertiary, lower	0.121	0.155	-10.393	0.000	0.121	0.127	-1.861	0.329
Tertiary, higher	0.053	0.096	-19.341	0.000	0.053	0.053	-0.084	0.962
Earn. 1988, 7021–9870	0.033	0.057	-13.906	0.000	0.033	0.038	-3.248	0.090
9871–11000	0.039	0.047	-4.260	0.004	0.039	0.041	-1.199	0.523
11001–12100	0.064	0.064	0.191	0.894	0.064	0.062	1.094	0.540
12101–13300	0.096	0.084	4.288	0.003	0.096	0.098	-0.671	0.713
13301–14500	0.111	0.107	1.516	0.292	0.111	0.108	1.202	0.512
14501–16000	0.151	0.124	7.393	0.000	0.151	0.144	1.995	0.271
16001–18000	0.170	0.143	7.339	0.000	0.170	0.175	-1.169	0.519
18001–21700	0.158	0.151	2.007	0.163	0.158	0.157	0.403	0.817
21701–	0.139	0.136	0.988	0.493	0.139	0.141	-0.442	0.745
Earn. 1989, 9751–11400	0.025	0.038	-8.221	0.000	0.025	0.028	-2.308	0.208
11401–12600	0.042	0.049	-3.408	0.019	0.042	0.045	-1.206	0.491
12601–13800	0.076	0.069	2.487	0.084	0.076	0.070	1.874	0.285
13801–15000	0.103	0.094	2.949	0.040	0.103	0.102	0.261	0.882
15001–16300	0.130	0.113	5.101	0.000	0.130	0.123	2.066	0.233
16301–18000	0.152	0.131	5.946	0.000	0.152	0.152	0.154	0.930
18001–20200	0.148	0.148	-0.094	0.948	0.148	0.148	-0.056	0.974
20201–24400	0.153	0.155	-0.438	0.762	0.153	0.157	-1.045	0.529
24401–200000	0.132	0.137	-1.280	0.376	0.132	0.134	-0.542	0.668
White-collar, low	0.205	0.244	-9.639	0.000	0.205	0.204	0.041	0.983
White-collar, high	0.091	0.140	-16.843	0.000	0.091	0.093	-0.658	0.698
Finnish speaker	0.947	0.949	-0.799	0.579	0.947	0.942	2.458	0.218
Swedish speaker	0.048	0.045	1.327	0.356	0.048	0.053	-2.457	0.219
Has spouse	0.746	0.685	13.825	0.000	0.746	0.742	0.690	0.719
N children, 1	0.215	0.198	4.342	0.002	0.215	0.222	-1.695	0.382
2	0.224	0.184	9.797	0.000	0.224	0.229	-1.156	0.549
3-	0.067	0.068	-0.402	0.780	0.067	0.065	0.881	0.649
House owner	0.326	0.344	-3.827	0.008	0.326	0.333	-1.508	0.434
Other housing type	0.218	0.274	-13.680	0.000	0.218	0.211	1.682	0.373

Table 8: Matching balance for men 2/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Region, 02	0.091	0.098	-2.275	0.116	0.091	0.092	-0.143	0.941
04	0.072	0.051	8.259	0.000	0.072	0.069	1.336	0.484
05	0.092	0.033	20.461	0.000	0.092	0.084	2.893	0.103
06	0.090	0.102	-4.124	0.004	0.090	0.093	-1.003	0.604
07	0.067	0.054	4.981	0.000	0.067	0.067	-0.287	0.883
08	0.052	0.039	5.895	0.000	0.052	0.052	0.417	0.829
09	0.025	0.028	-1.847	0.203	0.025	0.025	0.302	0.874
10	0.037	0.022	7.885	0.000	0.037	0.038	-0.383	0.842
11	0.052	0.046	2.709	0.059	0.052	0.058	-3.158	0.111
12	0.008	0.034	-28.465	0.000	0.008	0.006	2.712	0.120
13	0.020	0.029	-6.486	0.000	0.020	0.020	-0.209	0.915
14	0.070	0.036	13.055	0.000	0.070	0.070	-0.084	0.965
15	0.058	0.032	11.186	0.000	0.058	0.059	-0.388	0.842
16	0.010	0.012	-2.090	0.152	0.010	0.012	-2.208	0.278
17	0.034	0.066	-17.861	0.000	0.034	0.031	1.456	0.437
18	0.015	0.012	1.864	0.193	0.015	0.015	-0.455	0.815
19	0.019	0.025	-4.795	0.001	0.019	0.017	1.479	0.432
20	0.009	0.016	-7.551	0.000	0.009	0.009	-0.126	0.948
21	0.000	0.003	-19.141	0.000	0.000	0.000	1.095	0.465
Plant size, 26–50	0.238	0.170	15.990	0.000	0.238	0.241	-0.622	0.746
51–100	0.252	0.167	19.702	0.000	0.252	0.254	-0.289	0.878
100-	0.260	0.456	-44.644	0.000	0.260	0.249	2.615	0.150

Table 9: Matching balance for men 3/3

	Before matching				After matching			
	Treated	Control	Std. diff.	p-val.	Treated	Control	Std. diff.	p-val.
Industry, 02	0.001	0.008	-21.529	0.000	0.001	0.001	0.910	0.613
15	0.051	0.052	-0.625	0.665	0.051	0.056	-2.444	0.216
17	0.013	0.009	3.848	0.007	0.013	0.014	-0.928	0.636
18	0.014	0.002	9.826	0.000	0.014	0.010	3.640	0.030
19	0.004	0.004	0.704	0.624	0.004	0.005	-1.466	0.473
20	0.144	0.052	25.990	0.000	0.144	0.129	4.173	0.011
21	0.029	0.034	-3.178	0.029	0.029	0.027	0.841	0.659
22	0.052	0.030	10.021	0.000	0.052	0.057	-2.346	0.218
24	0.003	0.019	-31.217	0.000	0.003	0.002	0.786	0.673
25	0.009	0.018	-9.639	0.000	0.009	0.011	-1.946	0.319
26	0.082	0.042	14.677	0.000	0.082	0.082	-0.137	0.942
27	0.006	0.020	-18.094	0.000	0.006	0.007	-0.965	0.629
28	0.072	0.053	7.193	0.000	0.072	0.074	-0.960	0.611
29	0.074	0.092	-7.190	0.000	0.074	0.078	-1.596	0.407
30	0.000	0.001	-4.405	0.008	0.000	0.000	1.026	0.502
31	0.024	0.021	1.739	0.226	0.024	0.026	-1.582	0.424
32	0.003	0.008	-9.468	0.000	0.003	0.003	-0.394	0.842
33	0.002	0.008	-16.336	0.000	0.002	0.001	1.174	0.500
34	0.032	0.025	4.077	0.004	0.032	0.030	0.913	0.634
35	0.040	0.039	0.261	0.856	0.040	0.050	-5.108	0.011
36	0.063	0.027	15.082	0.000	0.063	0.063	-0.053	0.977
40	0.005	0.011	-8.611	0.000	0.005	0.004	2.102	0.241
45	0.091	0.077	4.823	0.001	0.091	0.080	3.655	0.039
50	0.035	0.033	0.789	0.584	0.035	0.038	-1.676	0.392
51	0.048	0.073	-11.728	0.000	0.048	0.048	-0.019	0.992
52	0.027	0.030	-1.693	0.243	0.027	0.028	-0.589	0.761
55	0.010	0.018	-8.136	0.000	0.010	0.010	-0.246	0.897
60	0.034	0.050	-8.761	0.000	0.034	0.035	-0.958	0.620
61	0.003	0.001	2.895	0.039	0.003	0.001	2.866	0.085
63	0.007	0.009	-3.548	0.016	0.007	0.007	-0.499	0.799
65	0.000	0.013	-63.923	0.000	0.000	0.001	-1.452	0.423
70	0.001	0.009	-35.616	0.000	0.001	0.000	1.686	0.278
71	0.002	0.001	2.709	0.053	0.002	0.003	-1.696	0.422
72	0.001	0.012	-46.056	0.000	0.001	0.000	1.264	0.446
74	0.018	0.050	-23.883	0.000	0.018	0.014	3.273	0.054
75	0.001	0.000	0.762	0.592	0.001	0.001	-0.537	0.791
80	0.001	0.003	-7.672	0.000	0.001	0.000	1.151	0.503
85	0.000	0.004	-26.585	0.000	0.000	0.000	0.456	0.796
91	0.001	0.003	-8.128	0.000	0.001	0.000	1.880	0.225
92	0.001	0.006	-16.310	0.000	0.001	0.001	-0.613	0.752
93	0.000	0.001	-9.114	0.000	0.000	0.000	1.045	0.492
99	0.000	0.000	0.609	0.666	0.000	0.000	-0.390	0.850

Note: Std. diff. is the standardized difference between treated and control units.